CalPERS
Investment Office
P.O. Box 2749
Sacramento, CA 95812-2749
Telecommunications Device for the Deaf - (916) 795-3240
(916) 795-3400

December 15, 2008

AGENDA ITEM 3d

TO: MEMBERS OF THE INVESTMENT COMMITTEE

I. SUBJECT: Proposed Changes to Currency Overlay Program

II. PROGRAM: Global Fixed Income / Total Fund

III. RECOMMENDATION: Approve proposed broad changes to the Statement of Investment Policy for Currency Overlay Program:

A. The Program shall be applied to the currency exposure aggregated at the Total Fund instead of exclusively for international equities;

B. The policy currency hedge (static) ratio shall be 15% of the Total Fund foreign currency exposures, subject to further review to be conducted by Staff and Wilshire; and,

C. The policy hedge ratio will be reviewed concurrently with the ALM study.

IV. ANALYSIS:

Introduction

Staff is seeking approval of three key proposed policy changes to the Currency Overlay Program from the Committee based upon prior discussions in January and June of 2008. Based on the Committee's direction, Staff will present an amended policy for the Currency Overlay Program to the Policy Sub-Committee in February 2009.

Wilshire's comments are included in Attachment 1. Wilshire has agreed with Recommendation A to apply the hedge at the Total Fund but has disagreed with Staff methodology for arriving at the hedge ratio in Recommendation B. This is discussed in more detail within this memo. Program changes concerning active currency management will be addressed by the Global Fixed Income Unit at a later date.

Background

Currency Risk

CalPERS asset allocation policy and asset class strategies now include non-US assets in all asset classes to expand the investment opportunities globally to gain diversification. The primary reason for investing in non-US assets relates to the return, risk and correlation characteristics of the underlying assets. However investing in non-US assets requires selling US dollars and buying foreign currencies to acquire the underlying assets.

This creates currency exposures which are a source of variable return on top of the underlying asset return. Thus currency exposures alter the return and risk of foreign investments. The currency risk is more apparent in marked to market public securities such as equities and fixed income. Private assets are marked to market less frequently and normally have long holding periods and hence currency risk is less apparent but just as relevant.

Among the public asset classes, the contribution of currency risk to total risk differs significantly from equities to fixed income. Studies have shown that for a U.S.-based investor currency risk contribution to total risk of an unhedged foreign equity portfolio is about 20% while it is much higher for an unhedged foreign bond portfolio at almost 90%[1]. This is an important consideration if hedges are applied at the individual asset class level.

A Staff-generated analysis of currency risk for international bond, international equity and a diversified portfolio is shown in Appendix A. This illustrates that the difference in risk between unhedged and hedged portfolios is much higher for international bonds than for international equities and is consistent with the study cited above. For a diversified portfolio of US equities, international equities, US bonds and international bonds, this difference was small at 0.24%. Hence the impact of currency risk at the CalPERS Total Fund is smaller than the international bond or equity portfolio due to diversification and cross correlation effects.

CalPERS can either accept or seek to manage the risk arising from currency exposures. Essentially there are three options in managing currency risks:

[1] Kurt Winkelmann, "International Diversification and Currency Hedging", Modern Investment Management, Wiley, 2003.

- 100% Hedge (Full hedge)

  In this case the percentage contribution of currency risk to total risk is zero since currency exposures are hedged back to US dollars. However, there are significant transaction cost and liquidity considerations to maintaining a full hedge. Since CalPERS pension liabilities are all in US dollars having a high foreign currency exposure may be considered a mismatch of assets and liabilities. This consideration would call for a 100% hedge or a high hedge ratio.

- 0% Hedge (Unhedged)

  In this case currency risk will have a positive contribution to the total risk. If the currency exposure and risk are not significant investors may decide to assume the currency risk and avoid the cost of hedging.

- Partial Hedge

  In this case the investor seeks to minimize currency risk by deriving an optimal hedge ratio between 0% and 100% of the currency exposure. As discussed below CalPERS has adopted a partial hedge approach.

Empirical evidence from various researchers point to a partial hedge solution but they are inconclusive in determining the exact hedge ratio. A minority of researchers have favored a fully hedged or unhedged approach.

Active currency management is another approach that seeks to generate excess returns on a risk adjusted basis by taking active currency positions (long or short) relative to the benchmark currency exposures. CalPERS does have a limited active currency management program under the internally managed active currency program.

<u>CalPERS Currency Program</u>

CalPERS established a currency hedge program in 1992 with a policy hedge ratio of 25% of the foreign currency exposure in developed market international equities. The existing Investment Policy for the Currency Overlay Program (Attachment 2) has four components:

A. Tactical Management Program;

B. Externally Managed Currency Overlay Program;

C. Internally Managed Passive Currency Overlay Program; and,

D. Internally Managed Active Currency Overlay Program.

The proposed changes under this item refer to the static hedge ratio and the tactical management of the hedge ratio as well as the currency exposure to be hedged. The policy for the Currency Overlay Program states that *"The Policy herein is framed in terms of hedging for the developed markets portion of the International Equity Program because this is the only program to which the currency overlay has long applied".*

The policy for the Tactical Management Program states that *"The static hedge ratio is 25% of the currency weights of the developed markets portion of the International Equity assets. The Staff Committee may vary the hedge ratio +/-5% (implying a range of 20% to 30% for the hedge ratio). The Staff Committee will meet every three to six months".*

The Staff review of currency policy has focused on the static hedge ratio and the currency exposure to which it should apply. Staff will recommend a range around the new hedge ratio to the Policy Subcommittee if the proposed changes are approved.

CalPERS Currency Exposure

During the 1992 to 2007 period, CalPERS unhedged exposure to foreign currency exposure increased from 16% to 26% of the Total Fund and included all asset classes. Additionally, with the adoption of the global benchmark for equities and new international targets in other asset classes, the total foreign currency exposure will increase to 42% when fully implemented, as summarized in Table 1 below.

Table 1. CalPERS Unhedged Foreign Currency Exposure

	% of Fund		
Asset Class	1992	2007	New Targets
Public Market Equity	12.0%	20.0%	32.7%
Fixed Income	4.0%	3.0%	2.0%
Other*	0.0%	3.0%	7.4%
Total	16.0%	26.0%	42.1%

* Real Estate, Private Equity (AIM), and Inflation Linked

The CalPERS currency hedging program generated gains during the 1996 to 2002 period when the U.S. dollar appreciated and losses since 2002 when the dollar depreciated. The net effect since 1992 is a slight decrease in Total Fund volatility.

The CalPERS currency hedge is applied as an overlay which does not require a capital allocation. The cost of currency hedge involves currency transaction costs (currency forwards/futures) plus the costs of trading securities to raise cash

to meet currency settlements. In order to maintain the currency hedges, cash flows are needed to periodically settle gains and losses as the positions are marked to market. CalPERS funds the settlements when the dollar depreciates and receives cash when the dollar appreciates. The higher the hedge ratio the greater is the cash outflow in periods of dollar depreciation.

V. STAFF PROPOSAL AND WILSHIRE COMMENTS:

A. Currency Overlay at Total Fund

As mentioned above the CalPERS currency overlay program limits hedging to international equity exposures in developed market currencies. Since the establishment of this program CalPERS currency exposures exist in other asset classes and have increased to approximately 42% of the Total Fund with the implementation of the new asset allocation policy. Staff believes that the currency overlay should consider currency exposures across all asset classes, not just international equities, and therefore should be applied as an overlay at the Total Fund. This allows for the measurement and management of currency risk at the Total Fund level and is more comprehensive and easier to apply through a single account. This will also allow for reporting of Total Fund return and risk on a hedged and unhedged basis. Additionally active currency overlay is better managed at the Total Fund. All individual asset classes will have unhedged benchmarks and allow for active currency management within their respective policies.

Wilshire is in agreement with *"Staff proposals to hedge the currency exposure in all asset classes and to calculate the impact of the hedge on performance only at the Total Fund level".*

B. Methodology for Calculating the Hedge Ratio at Total Fund

Staff Approach

Staff is recommending a partial hedge relative to the Total Fund currency exposure regardless of the particular asset class from where the currency exposure arises. Staff derived the optimal hedge ratio by plotting Total Fund risk (standard deviation of annual returns) at various hedge ratios ranging from 0% to 100% and selecting the ratio that minimizes the risk and also considering the cost of hedging. This leads to a hedge ratio of 16% of the foreign currency exposure at the Total Fund. The risk reduces slightly from 0% hedge to 16% and begins to increase for hedge ratios higher than 16% (see Appendix B). Hence Staff is recommending a hedge ratio of 15% at the Total Fund.

If monthly returns are used to calculate the standard deviation it results in a higher risk minimizing hedge ratio of 56%. Since CalPERS has a long investment horizon Staff believes the standard deviation of annual returns approach is appropriate.

For purposes of comparison Staff used a bottom-up approach to calculate the hedge ratio at the Total Fund by calculating the optimal hedge ratio for each international portfolio and aggregating these hedge positions to arrive at a Total Fund hedge ratio. The optimal hedge ratio for foreign bonds is 82% and 36% for foreign equities (Appendix C). It is not possible to derive optimal hedge ratios for the private asset classes since return data at different levels of hedging are not obtainable. If we ignore the private asset classes and arithmetically aggregate the hedge ratios for each public asset class to arrive at a Total Fund hedge ratio, that would amount to 41.0% of Total Fund currency exposure compared to Staff recommendation of 15% of Total Fund currency exposure

Under the existing policy the CalPERS hedge in dollar equivalent terms for the new Asset Allocation targets will be $14.2 billion. If the Staff-recommended hedge ratio of 15% is adopted the US dollar equivalent hedge will be $13.7 billion. If the hedge is calculated using the bottom-up method, the US dollar equivalent of the hedge will be much higher at $38 billion, resulting in much higher hedging costs and cash flow risk. These dollar values are based on Total Fund value of $217 billion as of September 30, 2008. A comparison of these methods is shown on Table 2.

Wilshire Approach

Wilshire has recommended *"that a hedge ratio for each asset class and, where necessary, each investment program, be calculated separately and then aggregated to determine the overall hedge ratio".*

Wilshire has also pointed out that *"picking a hedge ratio based on minimizing return variations in the past likely will not fit the structure of CalPERS investments in future years"* and that the Wilshire *"proposal to calculate individual hedge ratios at the asset class or investment program levels would be a part of a comprehensive risk management approach, since unhedged currency exposure is one of the larger risks in the portfolio".*

Staff will continue to work with Wilshire to develop these suggestions into a specific and applicable methodology to the extent possible. This may take six to nine months to develop. Until then Staff believes that the proposed Staff methodology is an acceptable solution because it meets

the objective of minimizing currency risk at the Total Fund at a reasonable cost.

Table 2. Comparison of Staff and Wilshire Proposals

Feature	Staff Proposal Top-Down	Bottom-Up	Wilshire Proposal
Objective	Minimize currency risk at Total Fund at reasonable cost	Minimize currency at Total Fund at reasonable cost	Treat currency as one element of a comprehensive system of measuring, monitoring and controlling risk across the CalPERS portfolio.
Application level	Currency hedge at Total Fund currency exposure	Currency hedge at Total Fund currency exposure	Currency hedge at Total Fund currency exposure
Determination of Total Fund currency hedge ratio	Single solution to determine hedge ratio that minimizes the volatility of Total Fund returns	Derive hedge ratio for each asset class or program separately and aggregate to determine overall hedge ratio at Total Fund	Aggregate asset class or portfolio hedge ratios. Use comprehensive risk management system. Not based on minimizing past return variations.
Resulting currency hedge ratio	15% of non-dollar currency exposure at Total Fund	Approximately 41% of non-dollar currency exposure at Total Fund.	Will vary over time as the CalPERS portfolio changes
Currency hedge program assets	$77.7 billion	$77.7 billion	TBD
Dollar equivalent of the hedge	$13.7 billion	$38 billion	TBD
Estimated annual transaction cost to maintain hedge	$17.8 million 13 basis points	$48.6 million 13 basis points	TBD
Required settlement for 10% decline in U.S.$	$1.37 billion	$3.8 billion	TBD

The Staff method (top-down) links the hedge ratio to Total Fund risk not just international exposure. The bottom-up approach determines optimal hedge ratios for the international portfolios in equities and fixed income and aggregates them. The aggregation of international portfolio optimal hedge positions to arrive at a Total Fund hedge ratio ignores the cross correlation effects of currencies (domestic and foreign) and asset classes. The low hedge ratio in the Staff method is plausible considering that the contribution of currency risk to total risk in a diversified portfolio such as the PERF is much smaller than at the level of the individual international

portfolio in equities or fixed income. The analysis in Appendix A illustrates this point.

C. Currency Hedge Benchmark

Under the existing policy the benchmark currency exposure to be hedged is the developed market currency exposure in the capitalization weighted equity index. With the proposed change to apply the currency hedge at the Total Fund level the benchmark currency exposure to be hedged is the sum of the developed market currency exposure of the international equity and international fixed income benchmark index exposures and the actual developed market currency exposure in real estate and private equity. This is because the international exposure in real estate and private equity is not based on any international benchmark index.

D. Hedge Ratio Range

The existing Currency Overlay Policy has a hedge ratio of 25% of international equity exposure and allows Staff to manage the hedge ratio within a range of +/- 5%. Staff will propose a new range when the new policy is submitted to the Policy Subcommittee should the current recommendations be approved.

VI. STRATEGIC PLAN:

This item is consistent with Strategic Plan Goal VIII, manage the risk and volatility of assets and liabilities to ensure sufficient funds are available, first, to pay benefits, and second, to minimize and stabilize contributions. This item is also consistent with Goal IX; achieve long-term, sustainable, risk-adjusted returns.

VII. RESULTS/COSTS:

This item is not expected to have any material cost.

Raymond Venner
Portfolio Manager
Asset Allocation

Eric Busay
Portfolio Manager
Global Fixed Income

Warren Trepeta
Senior Portfolio Manager
Global Fixed Income

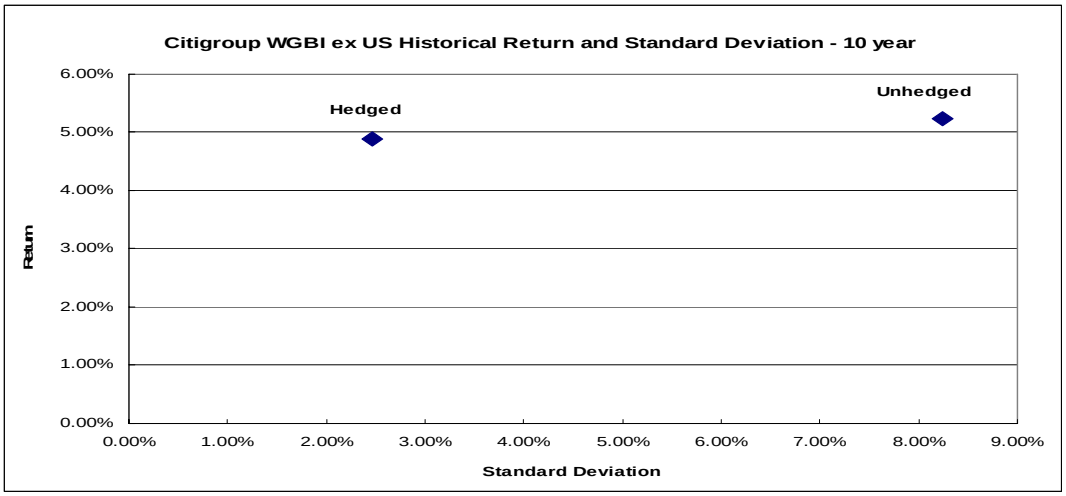
Curtis Ishii
Senior Investment Officer
Global Fixed Income

Farouki Majeed
Senior Investment Officer
Asset Allocation

Anne Stausboll
Interim Chief Investment Officer

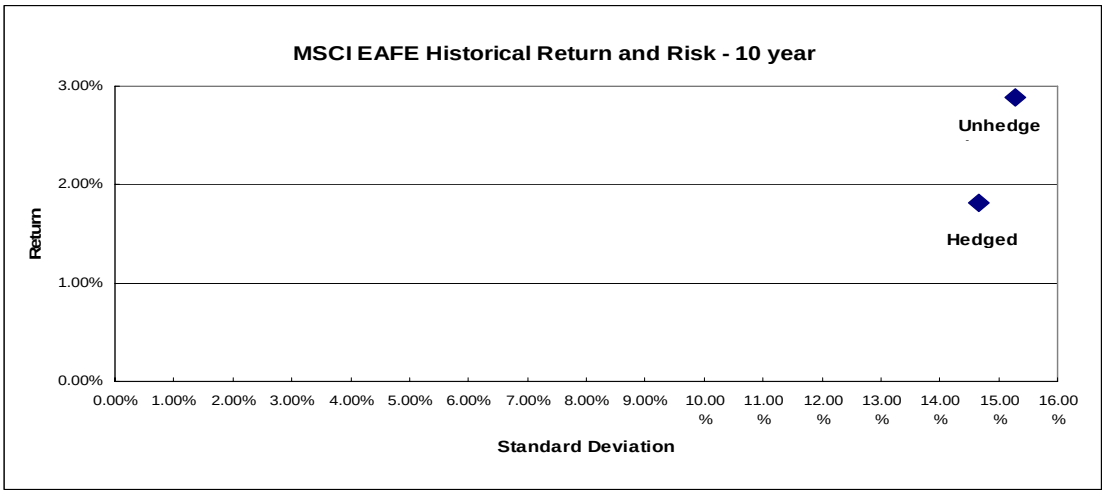
Appendix A
Contribution of Currency to Total Risk

Contribution of Currency to Total Risk - International Fixed Income



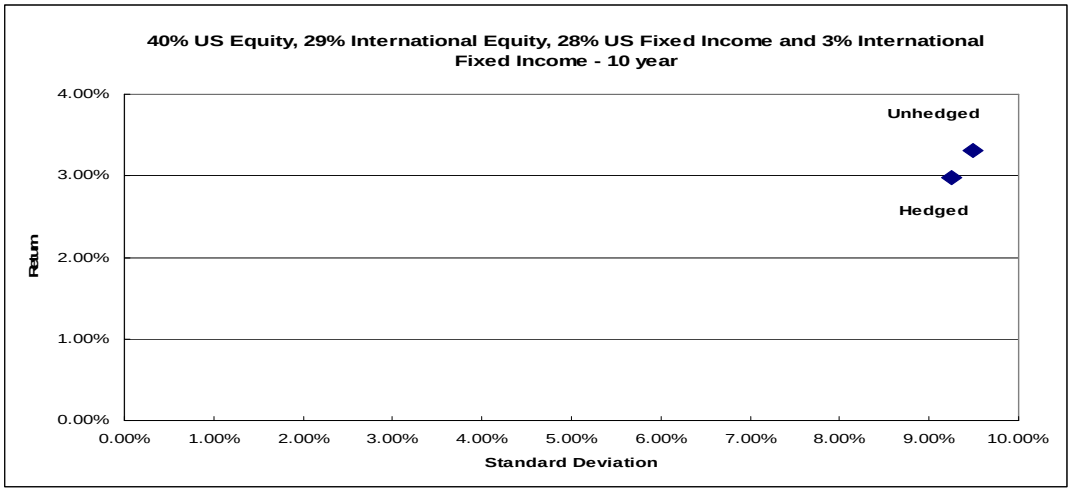
10 year period ending September 30, 2008	Standard Deviation	Annual Return
Hedged	2.47%	4.89%
Unhedged	8.24%	5.24%
Contribution of Currency Risk to Total Risk	70%	

Contribution of Currency to Total Risk - International Equity



10 year period ending September 30, 2008	Standard Deviation	Annual Return
Hedged	14.66%	1.81%
Unhedged	15.27%	2.88%
Contribution of Currency Risk to Total Risk	4%	

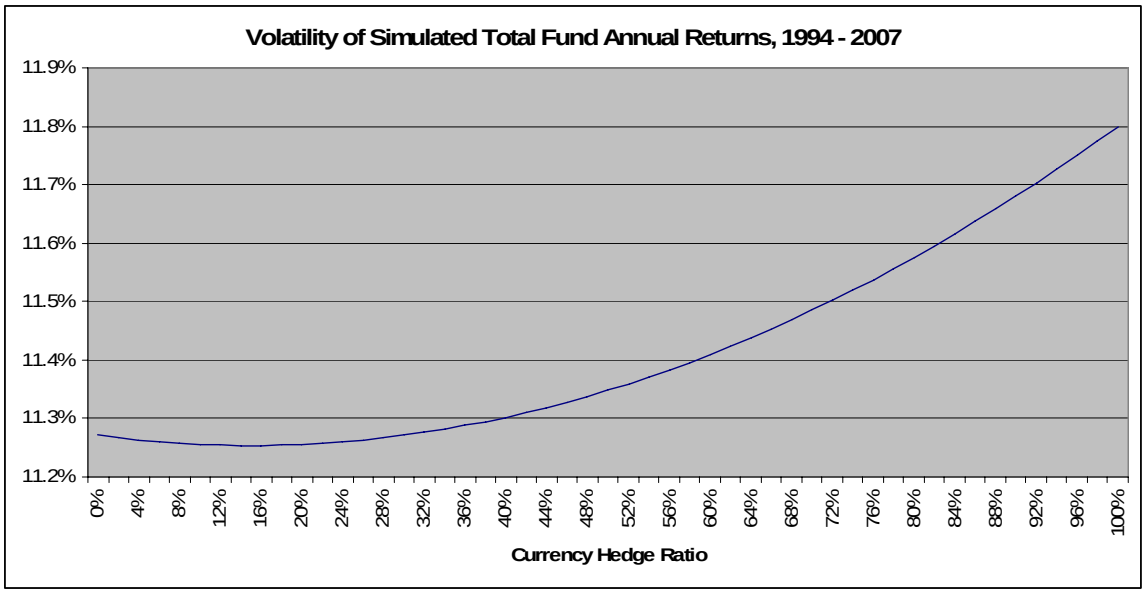
Contribution of Currency to Total Risk – Total Fund

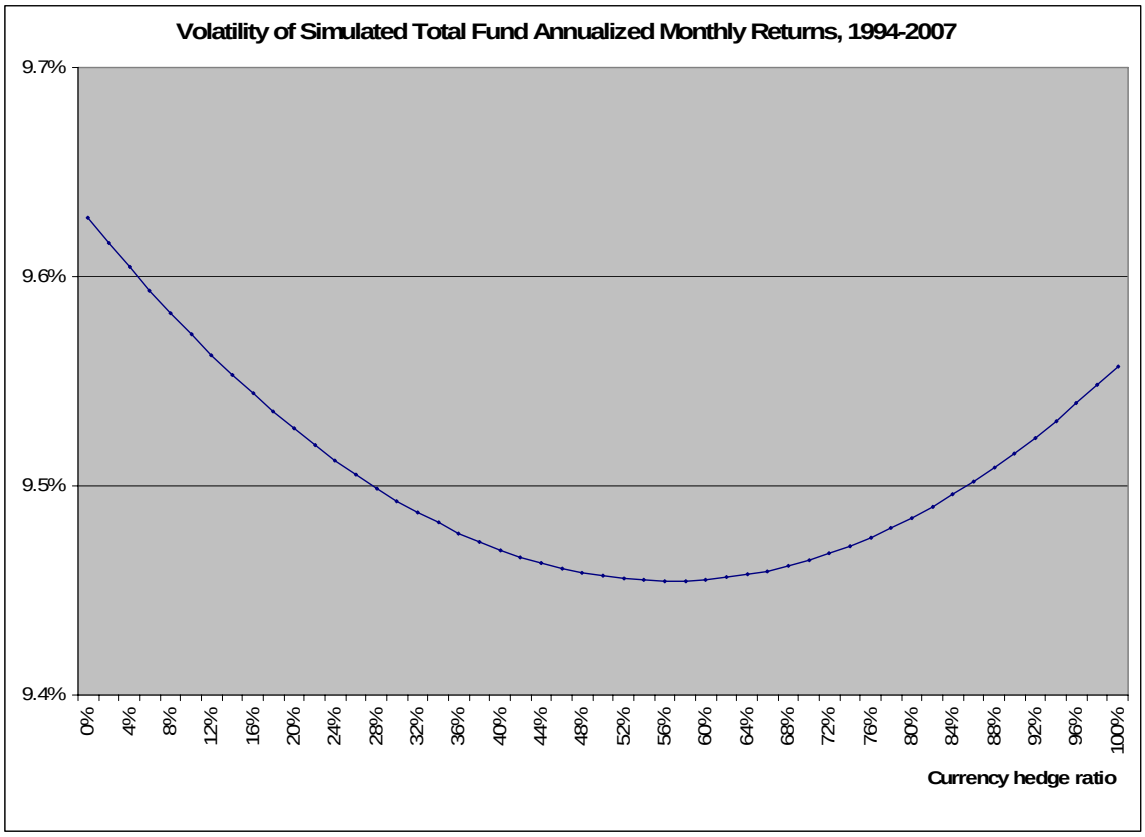


10 year period ending September 30, 2008	Standard Deviation	Annual Return
Hedged	9.25%	2.98%
Unhedged	9.49%	3.31%
Contribution of Currency Risk to Total Risk	2.51%	

Appendix B
Volatility-Minimizing Hedge Ratio: Method and Results

At a currency hedge ratio of zero (entirely unhedged), the volatility of simulated Total Fund annual returns was 11.27% over the 1994-2007 period. A 16% hedge ratio minimized the volatility of Total Fund annual returns at 11.25%. Currency hedge ratios above 16% resulted in more volatile returns.





Rolling annual returns updated monthly
Sources: MSCI (MSCI equity returns), Lehman (Lehman Aggregate Bond returns).

Assumptions

- Period: 1994.1 – 2007.12
- Rolling annual nominal returns
- International equity proxy = MSCI EAFE Index Unhedged
- International bond proxy = Citi World Govt. Bond Index Unhedged
- Total Fund return proxy =
    - 73% global equities (33.9% MSCI U.S. Equity + 39.1% MSCI EAFE Unhedged Index)
    - + 27% global fixed income (22.1% Lehman Aggregate Index + 4.9% Citi World Govt. Bond Index Unhedged)
    - + currency hedge return (EAFE Hedged minus EAFE Unhedged) ranging from 0% to 100% on the combined international investment.

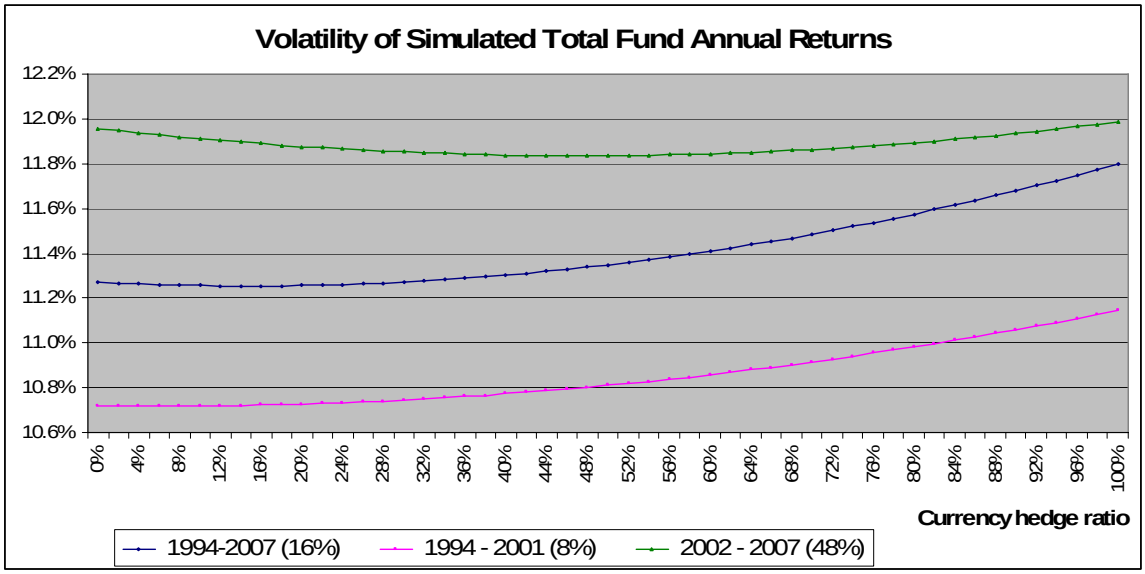
Real Estate and the non-bond portion of Inflation-Linked are allocated equally between equities and fixed income.

In order to test the sensitivity of the results to the time period, the volatilities of Total Fund returns were also calculated over a period of U.S. dollar appreciation (1994-2001, magenta line in chart below) and during U.S. dollar weakening (2002-2007, green line).

One finding was that the results are sensitive to the time period selected. The volatility minimizing hedge ratio was 8% during the 1994-2001 period, but 48% over the 2002-

2007 period. This result suggests that the effect of the hedge ratio on minimizing the volatility of returns should be complemented with other criteria in the selection of a policy hedge ratio.

Another finding was that a hedge ratio below 50% minimized the volatility of returns across all periods including periods of dollar strength and weakness. This finding supports the view that some level of exposure to foreign currencies provides valuable portfolio diversification.



Appendix C

Table C1. Bottom-up method of calculating a currency hedge ratio

column Investment	a Policy Weight, % of Fund	b Non-U.S. Weight, % Investment (1)	c = a*b Non-U.S. Weight, % of Total Fund #	d Volatility-minimizing hedge ratio
Public Mkt. Equities	56.0%	58.4%	32.7%	36.0%
Fixed Income	19.0%	10.5%	2.0%	82.0%
Private Equity (AIM)	10.0%	30.0%	3.0%	unknown
Real Estate	10.0%	33.0%	3.3%	unknown
Inflation-Linked				
IL Commodities	1.5%	0.0%	0.0%	NA
IL Bonds	1.0%	33.3%	0.3%	82.0%
IL Infrastructure	1.5%	40.0%	0.5%	unknown
IL Forestland	1.0%	40.0%	0.3%	unknown
TOTAL	100.0%		42.1	unknown

(1) Estimated target long term international allocation, net of currency hedging by general partner.

Table C2. CalPERS Currency Hedge Ratios and Exposures

Scenario	A	B
		Proposed
Currency Hedging Policy	Present	15% of Fund
Policy Asset Class Weights	New	New
Pre-hedge foreign currency exposure (% of fund)		
Int'l Equity	32.7%	32.7%
All other asset classes	7.4%	7.4%
Total Fund	42.1%	42.1%
Currency Hedge (% of Fund)	6.5%	6.3%
Post-hedge foreign currency exposure (% of Fund)		
Total Fund	35.6%	35.8%
Prehedge Currency exposures (billion $)		
U.S. dollar	125.6	125.6
Other Currencies	91.4	91.4
Total	217.0	217.0
Post-hedge Currency exposures (billion $)		
U.S. dollar	139.8	139.3
Other Currencies	77.2	77.7
Total	217.0	217.0
Effect of Hedge on Currency Exposures (billion $) = amount of hedging		
U.S. dollar	14.2	13.7
Other Currencies	-14.2	-13.7

Scenario	Asset Allocation	Policy Currency Hedge Ratio	
A	New	Present	(25% of int'l. eq. dev. mkt.)
B	New	Proposed	(15% of Total Fund foreign currency exposures)